

## CLAIMS

1. A nitride semiconductor device comprising a p-type nitride semiconductor layer, an n-type nitride semiconductor layer, and an active layer interposed between the p-type nitride semiconductor layer and the n-type nitride semiconductor layer, wherein,

the p-type nitride semiconductor layer includes:

a first p-type nitride semiconductor layer containing Al and Mg; and

a second p-type nitride semiconductor layer containing Mg,

the first p-type nitride semiconductor layer being located between the active layer and the second p-type nitride semiconductor layer, and

the second p-type nitride semiconductor layer having a greater band gap than a band gap of the first p-type nitride semiconductor layer.

2. The nitride semiconductor device of claim 1, wherein

the second p-type nitride semiconductor layer functions as a barrier layer for suppressing a carrier overflow from the active layer.

5        3. The nitride semiconductor device of claim 1, wherein,

the first p-type nitride semiconductor layer has an Al concentration of no less than  $1 \times 10^{20} \text{cm}^{-3}$  and no more than  $2 \times 10^{21} \text{cm}^{-3}$ ; and

10        a region of the first p-type nitride semiconductor layer in which the Al concentration is no less than  $1 \times 10^{20} \text{cm}^{-3}$  and no more than  $2 \times 10^{21} \text{cm}^{-3}$  has a thickness of 1 nm or more.

4. The nitride semiconductor device of claim 1, further comprising a non-doped nitride semiconductor layer which  
15 contains Al and which is located between the first p-type nitride semiconductor layer and the active layer.

5. The nitride semiconductor device of claim 4, wherein  
the non-doped nitride semiconductor layer has a smaller band  
20 gap than a band gap of the second p-type nitride

semiconductor layer.

6. The nitride semiconductor device of claim 5, wherein the non-doped nitride semiconductor layer has a band gap equal to the band gap of the first p-type nitride semiconductor layer.

7. The nitride semiconductor device of any of claims 4 to 6, wherein a total thickness of the non-doped nitride semiconductor layer and the first p-type nitride semiconductor layer is no less than 1 nm and no more than 50 nm.

8. The nitride semiconductor device of claim 7, wherein the second p-type nitride semiconductor layer has a thickness of no less than 5 nm and no more than 20 nm.

9. The nitride semiconductor device of claim 8, wherein a region of the second p-type nitride semiconductor layer which has an Mg concentration of  $8 \times 10^{18} \text{cm}^{-3}$  or less has a

thickness of 1 nm or less.

10. The nitride semiconductor device of claim 1,  
wherein,

5 the p-type nitride semiconductor layer further includes  
a third p-type nitride semiconductor layer having a smaller  
band gap than a band gap of the second p-type nitride  
semiconductor layer; and

the second p-type nitride semiconductor layer is located  
10 between the third p-type nitride semiconductor layer and the  
first p-type nitride semiconductor layer.

11. The nitride semiconductor device of claim 10,  
wherein the third p-type nitride semiconductor layer has a  
15 smaller band gap than the band gap of the first p-type  
nitride semiconductor layer.

12. The nitride semiconductor device of claim 10,  
wherein the third p-type nitride semiconductor layer  
20 functions as a cladding layer.

13. The nitride semiconductor device of any of claims 10 to 12, wherein at least one of the first p-type nitride semiconductor layer and the second p-type nitride semiconductor layer contains In.

14. The nitride semiconductor device of claim 13, wherein the second p-type nitride semiconductor layer has a greater In mole fraction than an In mole fraction of the first p-type nitride semiconductor layer.

15. A production method for a nitride semiconductor device including a p-type nitride semiconductor layer, an n-type nitride semiconductor layer, and an active layer interposed between the p-type nitride semiconductor layer and the n-type nitride semiconductor layer, wherein: the p-type nitride semiconductor layer includes a first p-type nitride semiconductor layer containing Al and Mg and a second p-type nitride semiconductor layer containing Mg; the first p-type nitride semiconductor layer is located between the active

layer and the second p-type nitride semiconductor layer; and  
the second p-type nitride semiconductor layer has a greater  
band gap than a band gap of the first p-type nitride  
semiconductor layer, the production method comprising:

5 a step of forming the n-type nitride semiconductor  
layer;

a step of forming the active layer;

a step of forming the first p-type nitride semiconductor  
layer containing Al and Mg by supplying both a source gas  
10 having Mg and a source gas having Al; and

a step of forming the second p-type nitride  
semiconductor layer by supplying a source gas having Mg.

16. The production method of claim 15, further  
15 comprising, before the step of forming the first p-type  
nitride semiconductor layer, a step of forming a non-doped  
nitride semiconductor layer which contains Al by supplying a  
source gas having Al without supplying any p-type impurities.

20 17. The production method of claim 15 or 16, wherein,

the first p-type nitride semiconductor layer has an Al concentration of no less than  $1 \times 10^{20} \text{cm}^{-3}$  and no more than  $2 \times 10^{21} \text{cm}^{-3}$ ; and

a region of the first p-type nitride semiconductor layer  
5 in which the Al concentration is no less than  $1 \times 10^{20} \text{cm}^{-3}$  and no more than  $2 \times 10^{21} \text{cm}^{-3}$  has a thickness of 1 nm or more.